

# Exercise-induced Elevations in Skeletal Muscle Histamine Contribute to Increased Post-Exercise Capillary Permeability

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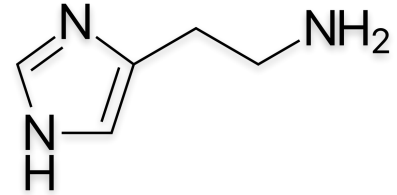
# Post-Exercise Recovery State

- Vasodilation
- Hyperemia
- Hypotension

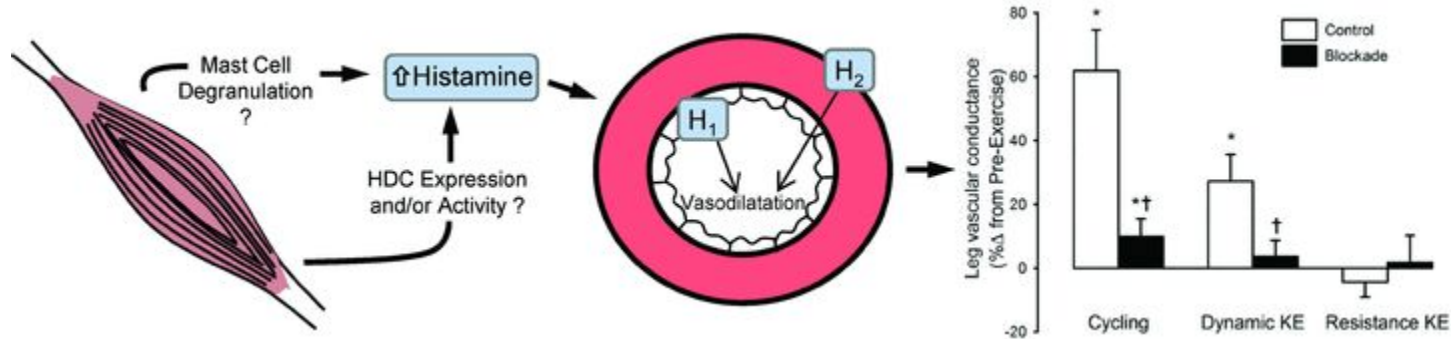


# What is histamine?

- Inflammatory and immune response
- Produced and released within skeletal muscle in response to exercise



# What is histamine?



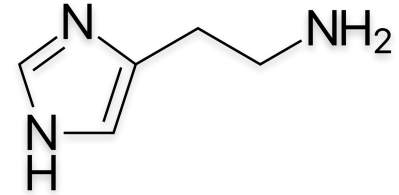
## Figure 1: Histamine Release and Effects in Skeletal Muscle Vasculature

Source: Halliwill, J. R., Buck, T. M., Lacewell, A. N., & Romero, S. A. (2013). Postexercise hypotension and sustained postexercise vasodilatation: what happens after we exercise?. *Experimental physiology*, 98(1), 7-18.



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# What is histamine?



- Inflammatory and immune response
- Produced and released within skeletal muscle in response to exercise
- Increases the permeability of blood vessels
  - Formation of fenestrations between endothelial cells, pericytes



# Research Question

Current literature has established two important concepts:

1. Histamine is released in skeletal muscle tissues during and after exercise.
2. Histamine causes an increase in capillary permeability

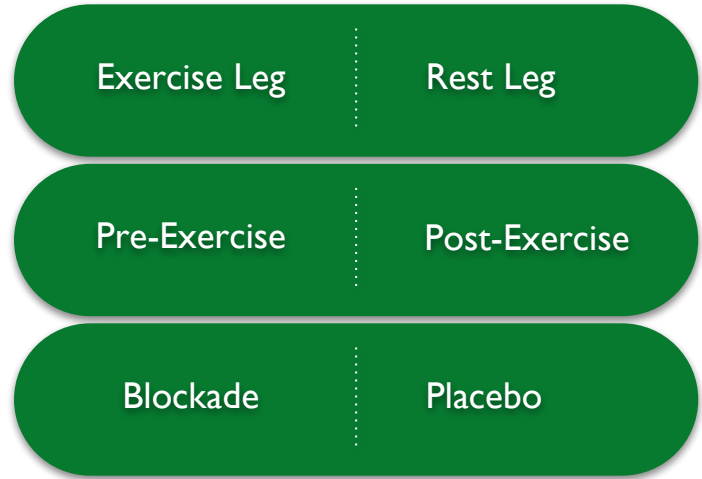
This study aims to piece these concepts together by asking the question, **does histamine contribute to increased capillary permeability following endurance exercise?**

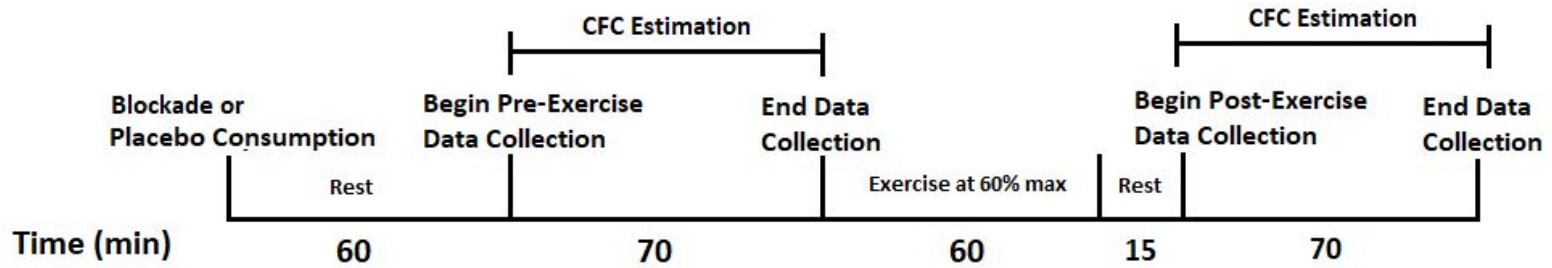


# Methods



- Double-blind placebo-controlled crossover study to assess capillary permeability **before and after** an endurance exercise bout.
- Compares the influence of a **histamine blockade versus placebo** in the exercise and rest leg.





**Figure 2:** A single visit protocol.



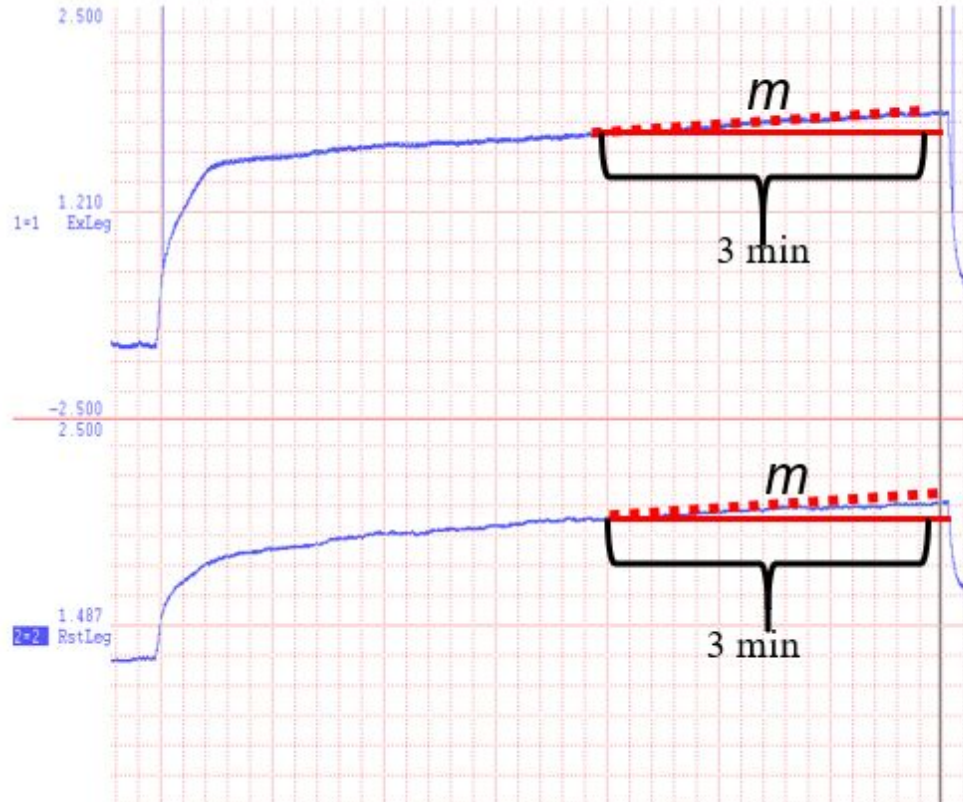




**Figure 3:** Subject during data collection.

- 3 pressure steps:
  - 20, 30, 40 mmHg
- Each pressure was maintained for 7 minutes, with data collection occurring during the last 3 minutes



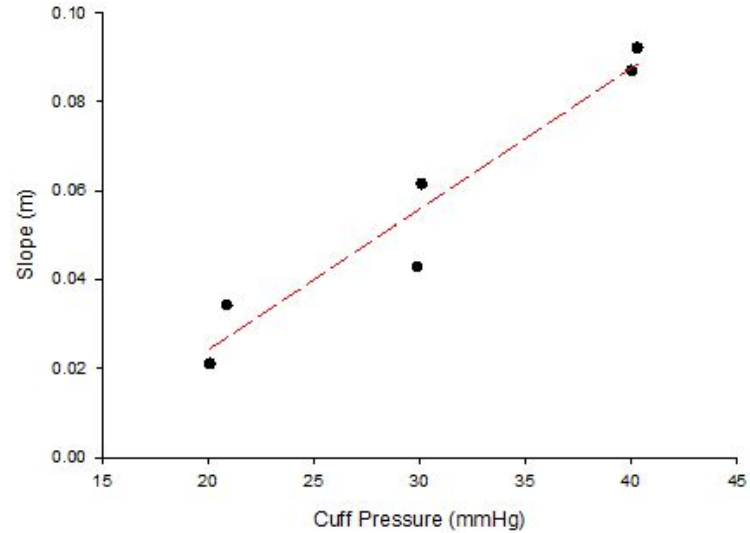


**Figure 5:** Representative Tracing of the Rate of Change ( $m$ ) in Limb Circumference vs Time



# Calculations

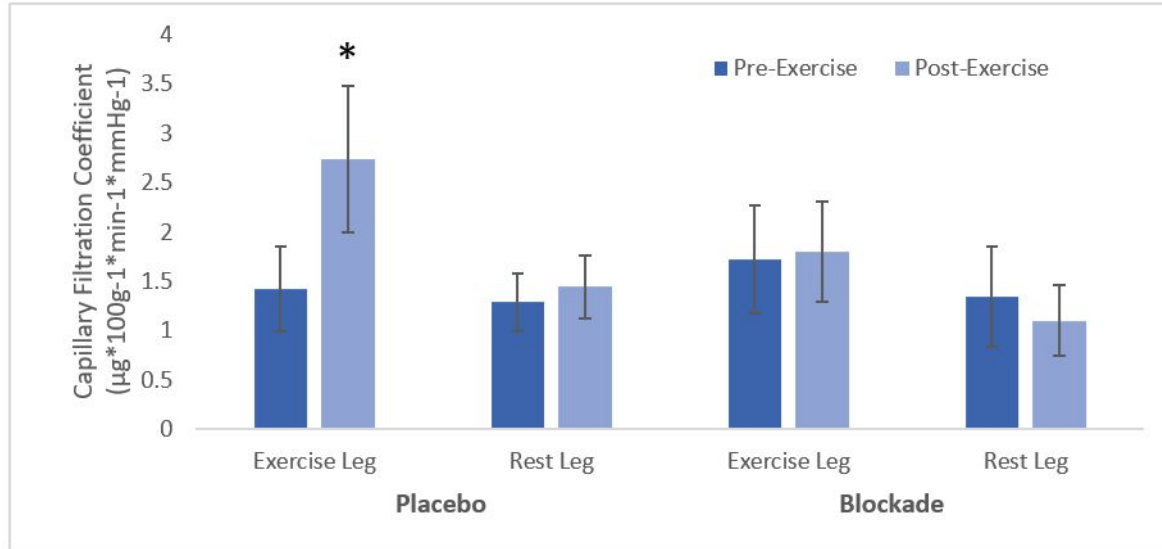
Capillary filtration coefficient (CFC) relates the **change in limb circumference to changes in venous occlusion pressures.**



**Figure 6:** A representative tracing of the rate of change (m) in limb girth and in cuff pressure.



# Results



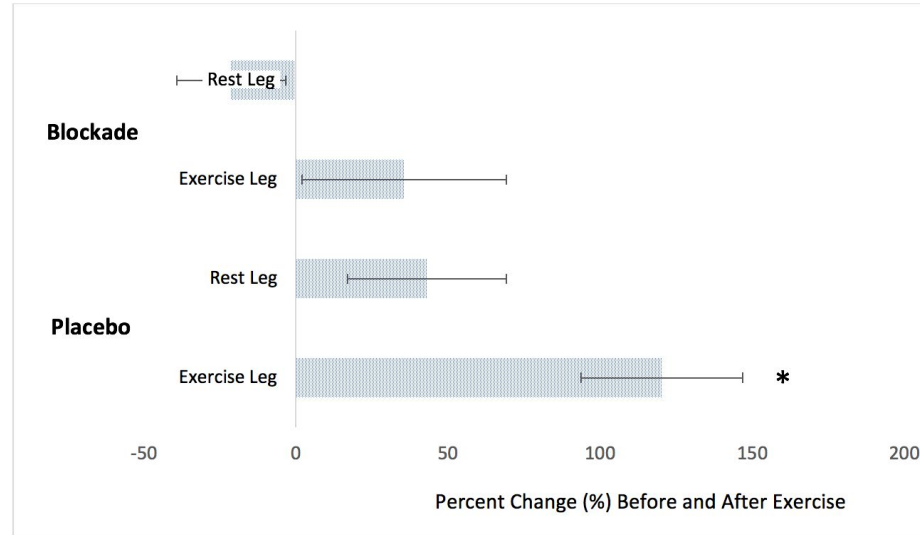
**Figure 7:** Change in CFC in the Exercise and Rest Leg pre and post-exercise under Placebo and Blockade conditions.

\* = Significant difference Pre to Post-Exercise



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# Results



**Figure 8:** Percent change in CFC pre and post-exercise under Placebo and Blockade conditions.

\* = Significant difference Pre to Post-Exercise



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# Conclusions

- CFC increased after exercise only in the Exercise Leg under Placebo conditions
- $H_1$  and  $H_2$  receptor antagonists decreased CFC following exercise
- Not a precise measure of capillary permeability on the cellular level



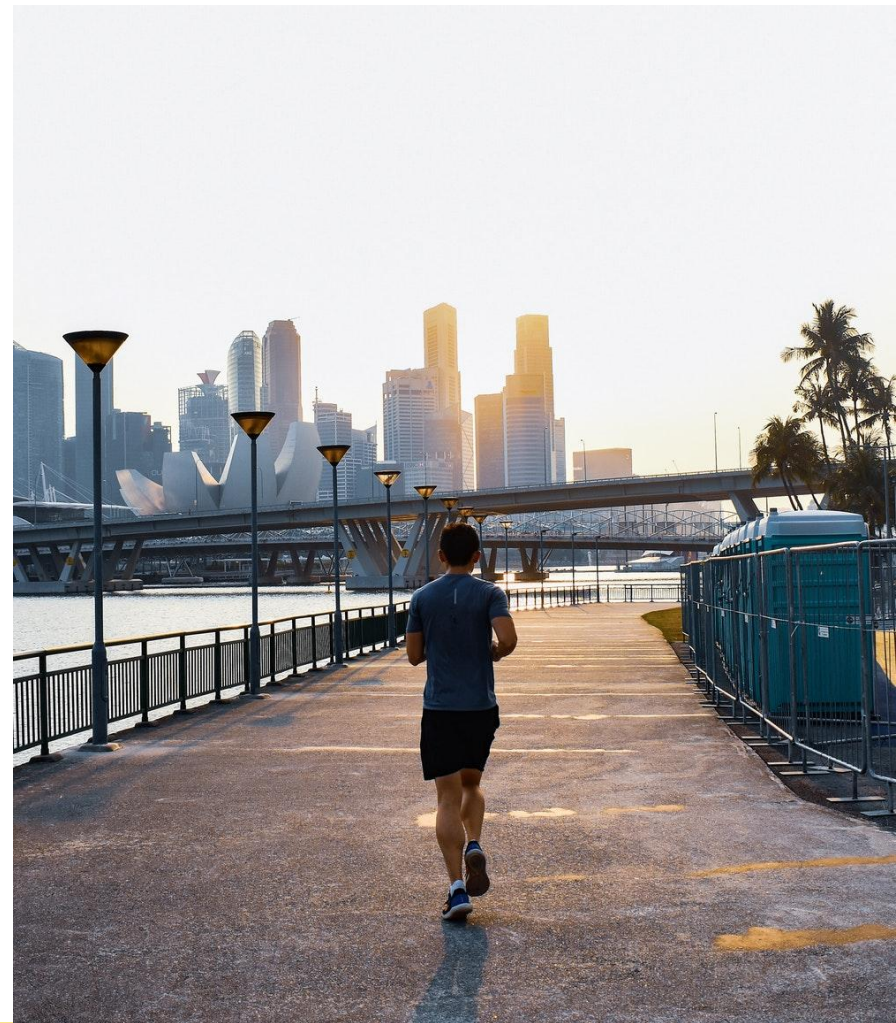
# Summary

- Histamine is released in skeletal muscle tissues during and after exercise.
- Histamine causes an increase in capillary permeability
- CFC measures compared pre and post-exercise under Placebo and Blockade conditions in an Exercise and Rest Leg
- Exercise associated increases in intramuscular histamine may contribute to changes in capillary permeability after exercise.



# Broader significance 🌍

- Athletic performance:  
post-exercise recovery
- Understanding histamine and  
cardiovascular adaptations





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